CLAIMS

1. An audio user-interfacing method in which items are represented in an audio field by corresponding synthesized sound sources from where sounds related to the items appear to

5   emanate, the method including the steps of:

(a) associating at least some of the sound sources into a collection of which they are members; and

(b) changing the collection in either direction between:

- an un-collapsed state in which the member sound sources are present un-muted in

10   the audio field;

- a collapsed state in which the member sound sources are muted and a collection-representing sound source provides an audible presence for the collection in the audio field.

15 2. A method according to claim 1, wherein the collection changes state, at least in one direction, in response to user command.

3. A method according to claim 1, wherein the collection changes state, at least in one direction, automatically upon detection of predetermined trigger conditions.

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4. A method according to claim 1, wherein the collection-representing sound source remains present in the audio field when the collection is in its un-collapsed state.

5. A method according to claim 1, wherein the collection-representing sound source is

25 muted when the collection is in its un-collapsed state.

6. A method according to claim 1, wherein the change between collection states, at least in one direction, is accompanied by a corresponding sound suggestive of moving to the end state of the current change.

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7. A method according to claim 1, wherein the change between collection states, at least in one direction, is accompanied by moving the member sound sources through the audio

field between their normal locations and the location of the collection-representing sound source, the direction of this movement being dependent on the end state of the current change.

5   **8.** A method according to claim 1, wherein when the collection is in its collapsed state, the collection-representing sound source provides an audio label for the collection, this label being repeated at intervals.

9. A method according to claim 1, wherein when the collection is in its collapsed state, the

10 collection-representing sound source outputs at least extracts of the sounds associated with the collection member sound sources when un-collapsed.

10. A method according to claim 1, wherein when the collection is in its collapsed state, the collection-representing sound source is used to provide audio notifications of events

15 related to the items represented by the member sound sources.

11. A method according to claim 1, wherein at least some of the said items represented by the sound sources are audio labels for services, the method further involving selecting a service by selecting the corresponding audio-label sound source.

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12. A method according to claim 1, wherein the collection is associated with a respective audio-field reference relative to which the member sound sources of the collection are positioned, other sound sources, if any, in the audio field being positioned relative to one or more further audio-field references, the audio-field references being independently

25 movable relative to a presentation reference determined by a mounting configuration of audio output devices used to synthesise said sound sources, with movement of a said audio-field reference relative to the presentation reference resulting in corresponding movement of the associated sound sources.

30 **13.** A method according to claim 12, wherein the audio field reference associated with the collection is world-stabilised and the member sound sources represent augmented reality services, each member sound source being positioned relative to the audio field reference

of the collection such that for a user located in a notional reference position, the sound source lies in the same direction as a corresponding real-world location associated with the augmented reality service represented by the sound source.

5   **14.** A method according to claim 1, wherein the audio field is rendered by apparatus including audio output devices according to sound-source data indicative of the rendering position and audibility of the each sound source in the audio field, the muting and un-muting of said member sound sources to collapse and un-collapse the collection being effected by changing the sound-source data for these sound sources to appropriately set the

10   audibility of the sources.

15. A method according to claim 1, wherein upon un-collapsing of the collection, at least some of the other sound sources, if any, in the audio field have their presentation adjusted.

15   **16.** Apparatus for providing an audio user interface in which items are represented in an audio field by corresponding synthesized sound sources from where sounds related to the items appear to emanate, the apparatus comprising:

- storage means for storing data on the sound sources, this data including audibility data for controlling the audibility of the sources in the audio field, and collection

20   data for associating at least some of the sound sources into a collection of which those sound sources are members and for further associating with the collection a collection-representing sound source;

- rendering-position determining means for determining, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound

25   in the audio field;

- collection-control means for changing the collection in either direction between un-collapsed and collapsed states and for correspondingly setting the audibility data of the associated sound sources such that:

- in the un-collapsed state of the collection, the member sound sources are

30   audible;

- in the collapsed state of the collection, the member sound sources are muted and the collection-representing sound source provides an audible presence for the collection in the audio field.; and

- rendering means, including audio output devices, for generating an audio field in which said sound sources are synthesized at their associated rendering positions and with audibility as set by said collection-control means.

17. Apparatus according to claim 16, wherein the collection-control means includes user input means for changing the collection state, at least in one direction.

18. Apparatus according to claim 16, wherein the collection-control means is operative to automatically change the state of the collection, at least in one direction, upon detection of predetermined trigger conditions.

19. Apparatus according to claim 16, wherein the collection-control means is operative to set the audibility data of the collection-representing sound source such that this source remains present in the audio field when the collection is in its un-collapsed state.

20. Apparatus according to claim 16, wherein the collection-control means is operative to set the audibility data of the collection-representing sound source such that this source is muted in the audio field when the collection is in its un-collapsed state.

21. Apparatus according to claim 16, wherein the collection-control means is operative in changing between collection states, at least in one direction, to modify the rendering positions of the member sound sources such they move through the audio field between their normal positions and the positions of the collection-representing sound source, the direction of this movement being dependent on the end state of the current change.

22. Apparatus according to claim 16, wherein when the collection is in its collapsed state, the collection-representing sound source provides an audio label for the collection, this label being repeated at intervals.

23. A method according to claim 16, wherein when the collection is in its collapsed state, the collection-representing sound source outputs at least extracts of the sounds associated

5   with the collection member sound sources when un-collapsed.

24. Apparatus according to claim 16, further comprising notification means operative when the collection is in its collapsed state, to provide via the collection-representing sound source, audio notifications of events related to the items represented by the member

10   sound sources.

25. Apparatus according to claim 16, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for enabling a user to select a service by selecting the corresponding audio-

15   label sound source.

26. Apparatus according to claim 16, wherein the rendering-position determining means comprises:

- means for setting the location of each said collection member sound source relative
20   to an audio-field reference;
- means for controlling an offset between the audio field reference and a presentation reference, the presentation reference being determined by a mounting configuration of the audio output devices; and
- means for deriving the rendering position of each sound source based on the location
25   of the sound source in the audio field and said offset.

27. Apparatus according to claim 26, wherein the collection member sound sources represent augmented reality services that have associated real-world locations, the rendering-position determining means being operative to world-stabilise the audio field

30   reference associated with the collection and to position each member sound source relative to the audio field reference such that for a user located in a notional reference position, the sound source lies in the same direction as the corresponding said real-world location.

28. Apparatus according to claim 26, wherein the said means for setting an offset between the audio field reference and a presentation reference, comprises user input means for enabling a user to change said offset, and stabilisation means for varying the said offset

5   such as to stabilise the audio field reference relative to one of:

-     a user's head;
-     a user's body;
-     a vehicle mounting the apparatus;
-     the world.

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29. Apparatus for providing an audio user interface in which items are represented in an audio field by corresponding synthesized sound sources from where sounds related to the items appear to emanate, the apparatus comprising:

-     a data store for storing data on the sound sources, this data including audibility data
15   for controlling the audibility of the sources in the audio field, and collection data for associating at least some of the sound sources into a collection of which those sound sources are members and for further associating with the collection a collection-representing sound source;

-     a rendering-position determining arrangement operative to determine, for each said
20   sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field;

-     a collection-control arrangement operative to change the collection in either direction between un-collapsed and collapsed states and to correspondingly set the audibility data of the associated sound sources such that:

25   -   in the un-collapsed state of the collection, the member sound sources are audible;

-     in the collapsed state of the collection, the member sound sources are muted and the collection-representing sound source provides an audible presence for the collection in the audio field.; and

30   -   a rendering subsystem, including audio output devices, arranged to generate an audio field in which said sound sources are synthesized at their associated rendering positions and with audibility as set by said collection-control means.

30. Apparatus according to claim 29, wherein the collection-control arrangement includes a user input arrangement for changing the collection state, at least in one direction.

5   31. Apparatus according to claim 29, wherein the collection-control arrangement is operative to automatically change the state of the collection, at least in one direction, upon detection of predetermined trigger conditions.

32. Apparatus according to claim 29, wherein the collection-control arrangement is
10   operative to set the audibility data of the collection-representing sound source such that this source remains present in the audio field when the collection is in its un-collapsed state.

33. Apparatus according to claim 29, wherein the collection-control arrangement is operative to set the audibility data of the collection-representing sound source such that this
15   source is muted in the audio field when the collection is in its un-collapsed state.

34. Apparatus according to claim 29, wherein the collection-control arrangement is operative in changing between collection states, at least in one direction, to modify the rendering positions of the member sound sources such they move through the audio field
20   between their normal positions and the positions of the collection-representing sound source, the direction of this movement being dependent on the end state of the current change.

35. Apparatus according to claim 29, wherein when the collection is in its collapsed state,
25   the collection-representing sound source provides an audio label for the collection, this label being repeated at intervals.

36. A method according to claim 29, wherein when the collection is in its collapsed state, the collection-representing sound source outputs at least extracts of the sounds associated
30   with the collection member sound sources when un-collapsed.

37. Apparatus according to claim 29, further comprising a notification arrangement operative when the collection is in its collapsed state, to provide via the collection-representing sound source, audio notifications of events related to the items represented by the member sound sources.

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38. Apparatus according to claim 29, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for enabling a user to select a service by selecting the corresponding audio-label sound source.

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39. Apparatus according to claim 29, wherein the rendering-position determining arrangement comprises:

- a setting arrangement for setting the location of each said collection member sound source relative to an audio-field reference;

15 - a control arrangement for controlling an offset between the audio field reference and a presentation reference, the presentation reference being determined by a mounting configuration of the audio output devices; and

- a deriving arrangement operative to derive the rendering position of each sound source based on the location of the sound source in the audio field and said offset.

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40. Apparatus according to claim 39, wherein the collection member sound sources represent augmented reality services that have associated real-world locations, the rendering-position determining arrangement being operative to world-stabilise the audio field reference associated with the collection and to position each member sound source

25 relative to the audio field reference such that for a user located in a notional reference position, the sound source lies in the same direction as the corresponding said real-world location.

~~26.~~ 41. Apparatus according to claim 26, wherein the said setting arrangement comprises a

30 user input arrangement ~~operative~~ to enable a user to change said offset, and a stabilisation arrangement operative to vary the said offset such as ~~to stabilise~~ the audio field reference relative to one of:

- a user's head;
- a user's body;
- a vehicle mounting the apparatus;
- the world.

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